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PRINT BY REFERENCE METHOD

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FOR PORTABLE WIRELESS DEVICES

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FIELD OF THE INVENTION

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A field of the invention is portable wireless devices. An

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additional field of the invention is printing.

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BACKGROUND OF THE INVENTION

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Portable wireless devices such as personal digital assistant (PDA)

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devices and portable wireless handsets, e.g., cell phones, enjoy widespread

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popularity. In particular, the portable, hand-held characteristics of these

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devices provide users with access to information and communication outlets in

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ways that were never before available. To ensure the continued popularity of

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portable wireless devices, attempts are being made to further expand the

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flexibility and capabilities of these portable wireless devices and to further

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enhance the services available to users of portable wireless devices. For

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example, portable wireless devices capable of accessing the Internet are

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available and Internet service providers that provide Internet access to portable

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wireless device users are becoming increasingly more common.

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Unfortunately, the limited memory, display and bandwidth

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capabilities of portable wireless devices restrict the Internet content readily

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available to a portable wireless device user. Specifically, the Internet content

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available to the portable wireless device user is typically presented in a bare

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1 bones format so that portable wireless device capabilities are conserved. As a
2 result, users will typically favor the richer Internet content available through
3 traditional Internet connections such as workstations and computers unless
4 circumstances such as travel prevent access to such computers. Thus, PDA
5 devices and wireless handsets are typically used either to access highly basic
6 content or to access content when circumstances prevent the user from
7 accessing content from another device.

8 Printing offers the opportunity for a user to view rich content, and
9 is often favored over viewing content through a full web browser or other
10 application on a personal computer or work station. Unfortunately, the
11 portable wireless devices, having limited capabilities, lack convenient printing
12 mechanisms. Moreover, connecting a portable wireless device to a printer via a
13 wired connection tends to defeat the purpose of having a portable wireless
14 device.

15 One answer to these concerns is found in efforts to have the
16 portable wireless devices communicate with peripherals and other devices
17 through wireless communications. The Bluetooth RF communication format is
18 directed toward expanding the utility of portable wireless devices by providing
19 a short range, typically about ten meters, communication channel for
20 communications between portable wireless devices and other Bluetooth
21 capable devices. However, standing alone, the communication channel offers
22 little to solve the print content dilemma faced by users of portable wireless
23 devices. Specifically, due to memory and bandwidth limitations portable
24 wireless devices are relatively poor portals to push content from or through to a
25 printer, even with the convenience of a Bluetooth or other similar wireless
26 communication capability.

27 BRIEF DESCRIPTION OF THE DRAWINGS

28 FIGURE 1 is a block diagram of a communication network
29 including a portable wireless device, a print device, an Internet content

1 provider and a print service;

2 FIG. 2 is a block diagram of the portable wireless device of FIG.

3 1;

4 FIG. 3 is a flow chart representing a print by reference method
5 for a portable wireless device that involves causing a print device to retrieve
6 and print content;

7 FIG. 4 is a flow chart representing a method for discovering a
8 print device for use in a print by reference method;

9 FIG. 5 is a flow chart representing a print by reference method
10 that involves supplying a security access code to a print device;

11 FIG. 6 is a flow chart representing a print by reference method
12 that involves sending a reference to a print service, causing the print service to
13 retrieve print content associated with the reference, and further causing the
14 print service to transmit the print content to a print device for printing; and,

15 FIG. 7 is a flow chart representing a print by reference method
16 that involves sending a reference to a print service, causing the print service to
17 retrieve print content associated with the reference, and further causing the
18 print service to transmit the print content to the portable wireless device.

19 20 SUMMARY OF THE INVENTION

21 According to a method for performing a print by reference
22 printing operation, a portable wireless device obtains a reference that indicates
23 the location of print content on a network; and then wirelessly communicates
24 the reference to a print device causing the print device to obtain the print
25 content from the network and further causing the print device to print the print
26 content obtained from the network. The method may further include steps
27 directed to obtaining the reference by selecting a hyperlink displayed on a web
28 site, storing the reference in a memory disposed in the communication device,
29 or retrieving the reference from an e-mail message received by the portable
30 wireless device. In addition, the method may include steps that allow a

1 security access code to be included in the reference for use by the print device
2 and/or a print service in obtaining access to the print content. Alternatively, the
3 security access code may be used to authorize access to the print device or print
4 service.

5 In a typical preferred example, the method may begin by
6 obtaining a reference to desired print content while performing an operation
7 such as web browsing over a wireless network. The obtained reference is
8 wirelessly communicated to a print device causing the print device to access a
9 print service which responds to the reference by using the reference to obtain
10 the desired print content. Security data may be communicated to the print
11 device for use in gaining access to the service offered by the print device. The
12 method may be performed to obtain print content from any of a variety of print
13 devices including, for example, a print device associated with an automated
14 teller machine, a print device associated with a fast food restaurant drive-up
15 menu board, a print device associated with a library and a print device
16 associated with a grocery store. Further, the method may include the step of
17 adding billing information to the reference to facilitate financial transactions
18 related to the use of any or all of the print device, print service and content
19 provider.

20 21 DETAILED DESCRIPTION

22 A simple form of the invention is a method by which a portable
23 wireless device may perform a print by reference printing operation. The
24 method generally involves obtaining a reference that indicates the location of
25 desired print content on a network. The reference may be obtained by a variety
26 of steps including but not limited to surfing the web, storing the reference in a
27 memory device disposed in the portable wireless device, entry of the reference
28 by a user of the portable wireless device or retrieving the reference from an e-
29 mail stored in a memory device associated with the portable wireless device.
30 The reference is wirelessly communicated to a print device causing the print

1 device to obtain the desired information from the network and further causing
2 the print device to print the desired information obtained from the network.
3 These basic steps enhance the usefulness of portable wireless devices by
4 expanding their printing capabilities with the use of a reference to content to be
5 printed.

6 The present method for use in portable wireless devices may be
7 conveniently understood by reference to a communication network as shown in
8 FIG. 1 that a portable wireless device executing the method may use to conduct
9 a print by reference operation. Specifically, and referring now to FIGs. 1 and
10 2, a portable wireless device 10 having print by reference capabilities may
11 comprise, for example, a personal digital assistant (PDA) or a mobile
12 communication device that includes an Internet interface 12 for providing
13 access to an Internet content provider 14 and/or for providing access to an
14 Internet/network based print service 16. The Internet interface 12, although
15 preferably able to support communication via cellular telephony, may instead
16 communicate with the Internet content provider 14 via any desired method,
17 e.g., via satellite communication. Further, although the print by reference
18 methods are described herein with respect to obtaining print content from the
19 Internet, the print by reference methods may be used to obtain print content
20 from any type of network including, for example, a local area network, a wide
21 area network, and an intranet. Thus, the Internet content provider 14 may
22 represent any network content provider and the Internet interface 12 may
23 interface with any type of network.

24 The portable wireless device 10 further includes an RF
25 communication interface 18 that allows the portable wireless device 10 to
26 communicate with an RF communication interface 20 disposed in a print
27 device 22 such as, for example, a printer or a multi-function peripheral
28 including a print function. Although, in a preferred embodiment the RF
29 communication interface 18 communicates with the print device 22 using a
30 Bluetooth wireless communication protocol and OBEX packet exchange

1 format, the RF communication interface 18 may instead communicate with the
2 print device 22 using any desired wireless protocol and packet format. For
3 example, in a preferred embodiment, the portable wireless device 10 may be
4 implemented with a Bluetooth enabled notebook computer having a Bluetooth
5 PC card manufactured by 3Com that operates according to the Bluetooth 1.1
6 specification and the print device 22 may be implemented using a Hewlett
7 Packard Deskjet 995c inkjet printer having integrated Bluetooth
8 communication capabilities.

9 To enable the execution of a print by reference method, the
10 portable wireless device 10 further includes data processing and memory
11 storage capabilities which may be implemented using, for example, a processor
12 19 and a memory device 21 for storing software instructions and further using a
13 temporary memory buffer 23. A set of software instructions stored in the
14 memory 21 may be executed by the processor 19 to enable any or all of the
15 methods described herein or the methods may instead be implemented using
16 hardware or a combination of hardware and software. In addition, any number
17 of hardware components may further be used to supplement or even replace the
18 processor 19 and memory devices 21, 23 and software instructions provided
19 that the print by reference methods are supported thereby. As will be
20 appreciated by one having ordinary skill in the art, the processor 19 may be
21 implemented using any suitable processor or controller capable of executing
22 software instructions or otherwise controlling the portable wireless device 10 to
23 enable the print by reference methods described herein. Further, the memory
24 devices 21, 23 may be implemented using any memory devices capable of
25 storing data. The portable wireless device 10 further may include a display
26 (not shown) for displaying data and a control panel (not shown) by which a
27 user may interface with the portable wireless device 10.

28 A set of methods are now described as being illustrative of the
29 variety of ways in which the print by reference method of the present invention
30 may be implemented. Further, the methods, which are described with reference

1 to a set of figures, i.e., FIGs. 3 - 7, are described as being implemented using
2 the wireless portable device 10, the print device 22, the print service 16 and the
3 Internet content provider 14 shown in FIGs. 1 and 2. Thus, an understanding
4 of the methods described with respect to FIGs. 3-7 may be enhanced by
5 reference to the components illustrated in FIGs. 1 and 2.

6 Referring now to FIG. 3, a first method 24 performed by the
7 portable wireless device 10 for causing a set of desired web pages or other
8 desired Internet or network content to be printed may begin when the portable
9 wireless device 10 obtains a reference that indicates the location of the desired
10 print content (step 26). For example, the portable wireless device 10 may
11 obtain the reference in response to a user command entered by the user while
12 surfing the Internet via the Internet interface 12. Specifically, while using the
13 Internet interface 12 to surf the Internet, the user may encounter the desired
14 print content and, upon deciding to download the desired data, may cause the
15 portable wireless device 10 to store a copy of a URL identifying the location of
16 the desired print content into the memory device 21 disposed in the portable
17 wireless device 10. This may occur, for example, when the user clicks on a
18 hyperlink that causes the content provider 14 to transmit a reference to the
19 portable wireless device 10 through the Internet interface 12. Alternatively, the
20 user may type the URL into the portable wireless device 10 and cause the
21 portable wireless device to store the URL in the memory device 21, or the user
22 may enter the URL into the portable wireless device 21 using any number of
23 known techniques such as a voice recognition/recording feature or a touch
24 screen. Instead of being entered by the user, the reference may be received at
25 the portable wireless device 10 via, for example, an e-mail message and then
26 stored in the memory device 21. Thus, the preferred portable wireless device
27 10 obtains the reference from the Internet, the memory device 21 or from an
28 input device associated with the portable wireless device 10 such as a keypad,
29 voice recorder, or touch screen.

30 After obtaining the reference, the portable wireless device 10

1 may wirelessly communicate the reference to the print device 22 via the RF
2 communication interface 18 (step 28). Wirelessly communicating the reference
3 to the print device may further include any number of additional steps such as,
4 for example, specifying additional data and/or establishing communication
5 with the print device 22 in accordance with the communication protocol being
6 used by the portable wireless device 10 and the print device 22.

7 Specifically, the reference may be a simple reference, e.g., a
8 URL, to the print content, or it may include any of a variety of data to support
9 different levels of print content retrieval and printing. For example, the
10 reference may be formatted according to a simple data format that includes
11 only enough information to locate the desired print content, e.g., a URL.
12 Alternatively, the reference may be formatted according to a richer data format
13 having a set of extensions or attribute fields that allow additional information to
14 be supplied with the reference including, for example, a set of security access
15 codes that may be used in response to security challenges, a URL that
16 represents the location of a remote print service such as the print service 16 that
17 may be used in accessing and formatting the print content for printing, and the
18 time/date that the reference was sent to the print device 22. Other attribute
19 fields may be defined to include, for example, a label providing a descriptive
20 name for the location identified by the reference, a URL that represents a proxy
21 service required to access the print content referred to by the reference, an
22 Internet address of the portable wireless device, an alternative reference or
23 address for obtaining the same or substitute print content, and data indicating
24 when print content should be printed beginning on a new sheet. Further,
25 attribute fields may be defined to include information used to restrict access to
26 the reference. For example, a type attribute may be defined to include an
27 encoding type that indicates how the print content at the location identified by
28 the reference is encoded. Further, a cookie attribute may be defined to
29 associate a print by reference job with previous information concerning
30 reference content or a portable wireless device seeking to access referenced

1 content. In addition, the reference may include a list of references, wherein
2 each reference represents separate print content and a separate print document
3 and further wherein each separate print document may be formatted differently.

4 As a further example, the reference may include a billing attribute
5 that enables billing for services rendered. Specifically, any or all of the
6 Internet content provider 14, the print service 16 and/or print device 22 may
7 require payment for usage thus requiring that each reference include
8 information that identifies the user of the portable wireless device 10 that
9 originated the print by reference request so that the user may be billed for the
10 services used. For example, the user may be provided with an account number
11 upon subscribing to the print service 16 or to the print device 22. Further, the
12 account number may be stored in the memory 21 disposed in the portable
13 wireless device 10 and the portable wireless device 10 may supply the account
14 number in an extension of the reference each time that a print by reference
15 request is executed. The print service 16 and the print device 22 may verify
16 that the account number is valid before rendering service, i.e., before
17 processing a print by reference request for the user. As will be appreciated by
18 one having ordinary skill in the art, the billing attribute may further be used to
19 enable billing for services rendered using any of a variety of other methods.

20 In addition to including a desired set of enhanced information and
21 formatting the reference into a proper data format, the formatting process
22 performed at the step 28 may further involve converting/modulating the
23 reference to a radio frequency signal at the RF interface 18 for wireless
24 transmission to the print device 22. Of course, if the portable wireless device
25 10 and print device 22 are equipped with, for example, infra-red interfaces
26 instead of RF interfaces, the formatting process will include
27 converting/modulating the reference to an infra-red signal instead of an RF
28 signal. Further, if the reference is obtained in a properly formatted state, then
29 the formatting process need only include converting the reference to a signal
30 adapted for transmission via the RF interface 12.

1 After having received the reference, the print device 22 may
2 respond by using the reference to download the print content associated with
3 the reference from the Internet content provider 14, provided, of course, that
4 the print device 22 is able to directly access the Internet content provider 14.
5 Alternatively, the print device 22 may instead respond to the reference by
6 providing the reference to a network/Internet based print service 16 that
7 downloads the print content from the Internet content provider 14, and that
8 further formats the print content for printing and transmits the formatted print
9 content to the print device 22 for printing.

10 After communicating the reference, the portable wireless device
11 may communicate a status request to the print device 22 after a predetermined
12 amount of time has elapsed (step 30). In response to the status request, the
13 print device 22 may transmit status information indicating the status of the print
14 by reference request. The status information might indicate whether the print
15 content was successfully retrieved from the Internet and/or whether the print
16 content was successfully printed. Upon receiving the message, the portable
17 wireless device 10 may perform any number of tasks to handle the message
18 (step 32) including, for example, storing the message in the memory device 21,
19 displaying the message, and sounding an alarm that alerts the user as to the
20 presence of the message. Alternatively, the print device 22 may automatically
21 transmit status information to the portable wireless device 10 such that the
22 portable wireless device 10 need not communicate a status request but need
23 only be prepared to receive status information from the print device 22.

24 As will be appreciated by one having ordinary skill in the art,
25 network security devices such as network firewalls typically prevent the
26 reception of print content or any other information from the Internet or any
27 other network at a user device unless initiated by the user. Thus, data
28 transferred from the Internet content provider 14 or the print service 16 to
29 either of the portable wireless device 10 or the print device 22 is preferably
30 performed using a data download or data pull operation wherein the data

1 transfer is initiated by either the portable wireless device 10 or the print device
2 22. This avoids the firewall problem. In contrast, data transferred from the
3 portable wireless device 10 to the print device 22 or the print service 16 may be
4 pushed or uploaded from the portable wireless device 10 to the print device 22
5 and to the print service 16. Of course, if network security is not an issue, a data
6 transfer may occur in any manner.

7 Referring again to FIGs. 1 and 2, the portable wireless device 10
8 may identify the print device 22 to which the reference is communicated using
9 any number of methods. For example, the portable wireless device 10 may be
10 preconfigured to communicate the reference to a print device 22 that is
11 proximally located to the user during the user's daily routine, i.e., a print device
12 residing in the user's office where the user spends most of the work day. As
13 will appreciated by one having ordinary skill in the art, the portable wireless
14 device 10 may be preconfigurable using any number of methods, including for
15 example, a menu driven method wherein the portable wireless device 10
16 displays a print device selection menu that allows the user to select one or more
17 print devices 22. Additionally, the portable wireless device 10 may supply a
18 data input field in which the user may specify a default or preferred print
19 device 22.

20 Referring now to FIG. 4, in another embodiment, the portable
21 wireless device 10 may perform a method 34 for locating a print device 22 by
22 wirelessly communicating discovery signals according to a conventional local
23 network discovery protocol. Specifically, a user may initiate the network
24 discovery protocol using, for example, a print device discovery command
25 which may cause the portable wireless device 10 to communicate a discovery
26 signal that includes a request for information (step 36).

27 As will be appreciated by one having ordinary skill in the art,
28 conventional network discovery features allow a user operating a network
29 device to discover other devices attached to the network. Further, the
30 discovery feature is typically defined, at least in part, by the communication

standard or specification associated with the network in use. Thus, the portable wireless device 10 may transmit discovery signals according to the communication protocol for which the portable wireless device is configured. For example, if configured to operate using a Bluetooth communication protocol, the portable wireless device 10 may perform the discovery feature using a Service Discovery Protocol defined in the Bluetooth communication specification.

The portable wireless device 10 may then wait until a response is received from one or more locally disposed print devices 22 (step 38). The responsive signals may include, for example, instructions regarding the location of the responding print devices 22 so that the user may proceed to the nearest print device 22 and initiate a print by reference method (step 40) such as the method 24 described with respect to FIG. 3.

The responsive signals may further include information pertaining to the capabilities of the responding print device(s) 22. For example, the responsive signals may include information specifying whether the print device 22 has color printing capabilities, whether the print device 22 is equipped for printing specialized graphics files and further specifying the costs associated with using the print device 22 to print a document. The portable wireless device 10 may display the responsive information or otherwise communicate the information to the user so that the user may determine which of the responding print devices 22 to select. Of course, if no responsive signals are received at the portable wireless device 10, the portable wireless device 10 may again transmit print device discovery signals (step 36) for any number of times, until a responsive signal is received, or until the user halts the print device discovery method 34.

The print device discovery feature may be especially useful for the traveling user who frequents airports or other public places that may include, for example, kiosks equipped with print devices 22 for use by airport visitors. Thus, for example, the responding print device 22 may provide the

1 user with an airport terminal name and gate at which the kiosk is located. With
2 appropriate billing information, the user might also be able to print a ticket
3 from a responding print device 22. As will further be appreciated by one
4 having ordinary skill in the art, the portable wireless device 10 may initiate a
5 network discovery protocol in response to any number of user inputs. For
6 example, the portable wireless device 10 may display a menu having a plurality
7 of options wherein one of the available options allows the user to initiate the
8 network discovery protocol. Alternatively, the portable wireless device 10 may
9 be equipped with a control switch or button that, when depressed by the user,
10 causes the network discovery protocol to be invoked and when depressed a
11 second time causes the network discovery protocol to be halted. Instead, the
12 portable wireless device 10 might also automatically invoke the network
13 discovery protocol every time the portable wireless device 10 is powered up or
14 every time a print by reference request is initiated.

15 Referring now to FIG. 5, as described with respect to the method
16 24 of FIG. 3, the step of wirelessly communicating the reference may involve
17 supplementing the reference with additional information. For example, the
18 reference may be supplemented to include security access code(s) that enable
19 usage of the print device 22 and/or the print service 16, or that may enable
20 access to the desired print content. In another embodiment, the portable
21 wireless device may format the reference to specify security access codes only
22 in response to a security challenge received from the print device 22, print
23 service 16 or Internet content provider 14 after initially sending a reference
24 without codes.

25 In particular, the portable wireless device 10 may perform a print
26 by reference method 42 that begins when the portable wireless device 10
27 obtains the reference (step 44). After obtaining the reference, the portable
28 wireless device 10 may wirelessly communicate the reference to the print
29 device in a format that does not include a security access code (step 46).

30 In response to the reference, the print device 22, print service 16

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1 or the Internet content provider 14 may supply a security challenge to the
2 portable wireless device 10 to inform the portable wireless device that usage of
3 the print device 22 and/or the print service 16 and/or that access to the print
4 content has been denied and further requesting a security access code.

5 The security challenge may be routed from the device that
6 originated the security challenge to the portable wireless device 10 via the print
7 device 22 or may instead be directly transmitted to the portable wireless device
8 10 by the device originating the security challenge. In any event, the portable
9 wireless device 10 receives the security challenge (step 48) and then responds
10 to the security challenge by formatting the reference to specify the required
11 security access codes and then wirelessly communicating the formatted
12 reference to the print device 22, print service 16 or Internet content provider 14
13 as required (step 50). For example, the portable wireless device 10 may
14 communicate the formatted reference to the print device 22 which may then
15 forward the formatted reference to the print service 16 and/or Internet content
16 provider 14. Alternatively, the portable wireless device 10 may communicate
17 the formatted reference to the print service 16 and/or the Internet content
18 provider 14 directly. Once the security access code has been received by the
19 device originating the security challenge, the print content may be downloaded
20 and then transmitted to the print device 22 for printing.

21 After the reference having the security access codes has been
22 successfully communicated to the print device 22, the portable wireless device
23 10 may request and receive status information from the print device 22 (step
24 53). Likewise, if a security challenge is not received at the step 48, the portable
25 wireless device 10 may request and receive status information from the print
26 device 22 (step 53).

27 As will be appreciated by one having ordinary skill in the art, as
28 an alternative to supplying security access code(s) via the reference, the
29 security access code(s) may instead be supplied in a separate message
30 communicated with, before or after the reference.

Referring now to FIG. 6, in a still further embodiment the portable wireless device 10 may communicate directly with the print service 16 instead of the print device 22 according to another method 52. Specifically, the method 52 begins when the portable wireless device 10 obtains a reference that indicates the location of the desired print content (step 54) and that further specifies a print device 22 to which the print content shall be forwarded for printing. The reference is then communicated to the print service 16 (step 56). Of course, if the reference is not obtained with information that specifies a print device 22, then the step of communicating the reference to the print service 16 will include the step of supplementing the reference with information that specifies a print device 22 to which the print content shall be forwarded for printing. The print service 16 responds to the reference by downloading the desired content and then forwarding the desired print content in a print ready format to the print device 22 specified in the reference. Provided that the print device 22 has the capability to convert the print content to a print ready format, the print service 16 may instead supply the print content to the specified print device 22 in non-print ready format, in which case, the print device 22 will be required to perform any format conversions necessary to enable printing of the print content.

At any time after the portable wireless device has sent the reference to the print service 22, the portable wireless device 10 may transmit a status request to the print device 22 (step 58) and then, upon receiving responsive status information from the print device 22, may store the status message and alert the user as to the presence of the message (step 60).

Referring now to FIG. 7, in a still further embodiment the portable wireless device 10 may communicate directly with the print service 16 and cause the print service 16 to transmit the print content back to the portable wireless device 10 instead of the print device 22. Specifically, a method 62 begins when the portable wireless device 10 obtains a reference that indicates the location of the desired print content (step 64) and that specifies that the

1 print content is to be delivered to the portable wireless device 10. The portable
2 wireless device 10 then communicates the reference to the print service 16
3 (step 66).

4 The print service responds to the reference by downloading the
5 desired print content, and then transmitting the desired print content to the
6 portable wireless device 10 as specified in the reference. In addition to sending
7 the reference to the print service 16, the portable wireless device 10 establishes
8 communication with the print device 22 via the RF interface 18 and sends a
9 message instructing the print device to prepare to receive print content or any
10 other print content from the portable wireless device 10 (step 68).

11 Upon receiving the print content from the print service 16, the
12 portable wireless device 10 may use a store and forward, e.g., streaming,
13 operation to transmit the print content to the print device 22 (step 70). The
14 store and forward operation may be performed using any of a variety of steps
15 including temporarily storing the data received from the print service 16 in the
16 memory buffer 23 disposed in the portable wireless device 10, converting the
17 buffered data to a format suitable for transmission via the RF interface 18, and
18 transmitting the RF formatted print content to the print device 22 for printing.
19 After transmitting the print content to the print device 22, the portable wireless
20 device 10 may communicate a status request to the print device 22 (step 72).
21 Upon receiving status information from the print device 22, the portable
22 wireless device 10 may store the message and/or alert the user as to the
23 presence of the message (step 74).

24 The portable wireless device 10 may receive one or more error
25 messages from one or more of the print device 22, print service 16 or the
26 Internet content provider 14 during any of the methods described herein.
27 Moreover, the portable wireless device 10 may perform any of a variety of
28 desired tasks in response to any of the received error messages during any of
29 the methods. For example, in response to an error message indicating that the
30 reference does not exist or cannot be accessed, the portable wireless device 10

1 may display a message informing the user as to the inaccessible status of the
2 reference.

3 From the foregoing description, it should be understood that a
4 print by reference method for portable wireless devices has been shown and
5 described, having many desirable attributes and advantages. In particular, the
6 method provides a portable wireless device user with print capabilities.
7 Specifically, the method causes the portable wireless device to obtain a
8 reference corresponding to a location at which desired network content is
9 located and then wirelessly communicate the reference to a print device or a
10 print service. The reference causes the print device to access a network content
11 provider to download the desired print content or instead causes the print
12 device to forward the reference to a print service which accesses a network
13 content provider to download the desired print content. After downloading the
14 print content, the print service may format the print content for printing and
15 then deliver the formatted print content to the print device for printing.
16 Likewise, if retrieved by the print device, the network print content is formatted
17 for printing and then printed by the print device.

18 While various embodiments of the present invention have been
19 shown and described, it should be understood that other modifications,
20 substitutions and alternatives are apparent to one of ordinary skill in the art.
21 For example, although the steps of the methods described herein are illustrated
22 and described as being performed in a particular order, many of the steps may
23 be performed in a different order without affecting the end result, i.e., printed
24 network content.

25 Such modifications, substitutions and alternatives can be made
26 without departing from the spirit and scope of the invention, which should be
27 determined from the appended claims.

28 Various features of the invention are set forth in the appended
29 claims.